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(71) Applicant

Montedison SpA

(Italy),

31 Foro Buonaparte,

Milan, Italy

(72) Inventors

Alberto Belfanti,

Sergio Maccone

(74) Agent and/or Address for
Service

Lloyd Wise, Tregear and

Co.,

Norman House, 105—109

Strand, London

WC2R 0AE

(54) **Pesticide formulations suitable
for yielding aqueous suspensions
sprayable by means of aircraft**

(57) A pesticide formulation
comprising:

a) from 90 to 99% by weight of one
or more pesticide compositions in the
form of a wettable powder,

suspension, emulsion or solution,

b) from 1 to 10% by weight of

sodium polymethacrylate having a
molecular weight of from 5,000 to
90,000,

the pesticide formulation being readily
capable of dispersion or dilution with
water to provide a sprayable
composition containing from 3 to 30%
of said pesticide formulation, which
sprayable composition may be
distributed from an aircraft with little
or no drift effect.

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SPECIFICATION

Pesticide formulations suitable for yielding aqueous suspensions sprayable by means of aircraft

This invention relates to single pack pesticide formulations which are suitable to be sprayed by aircraft, after dilution or dispersion in water. In particular, the invention relates to pesticide formulations in the form of powder, suspension or aqueous solution, which, once dispersed or diluted in water, may be spread by aircraft without undergoing a "drift effect".

During spraying cultivations with aqueous suspensions or solutions from the air it is necessary to ensure the formulation distributed by an aircraft does not drift from its intended path under the influence of breeze and the loss of weight suffered by the droplets during their fall due to evaporation of water or solvent, thus scattering pesticide over areas which should not be treated. Furthermore, it is necessary that the droplets, once they have reached the target, satisfactorily adhere to the vegetation, covering same with the most uniform film possible and providing the desired amount of pesticide.

According to current practice, the suspension or solution of the pesticide agents to be distributed from the air is obtained by the addition to the aqueous suspensions of the pesticide of products based on derivatives of cellulose or polyvinyl alcohol. However, such additives have the drawbacks of swelling or being solubilised only after a long time and of forming agglomerates and sediments which often clog the spray nozzles causing poor covering of the area to be sprayed due to formulation of oversize droplets.

It is an object of the present invention to provide pesticide formulations in which these disadvantages are substantially reduced.

According to the present invention there is provided a pesticide formulation comprising:

- a) from 90 to 99% by weight of one or more pesticide compositions in the form of a wettable powder, suspension, emulsion or solution,
 - b) from 1 to 10% by weight of sodium polymethacrylate having a molecular weight of from 5,000 to 90,000,
- the pesticide formulation being readily capable of dispersion or dilution with water to provide a sprayable composition containing from 3 to 30% of said pesticide formulation, which sprayable composition may be distributed from an aircraft with little or no drift effect.

The invention provides a formulation that may be dispersed or dissolved directly in water without the addition of any other ingredients to provide a composition which may be sprayed from aircraft without formation of oversized droplets and with minimal drift effect. The formulation of the invention may be diluted to form compositions which do not swell, nor give place to agglomerates and deposits and are sufficiently stable with time so as to allow its suspension in water without any critical time factor before application, i.e. the composition may be formed immediately before or some hours before application.

The formulations of the invention ready to be dispersed in water before being spread over the cultivations by aircraft, may contain all the necessary ingredients for developing the desired pesticidal action, adherence to the vegetation, uniformity of the spreading and for minimising drifting or evaporation during the spraying.

The pesticide compositions used as component a) in the formulations of the invention contain a pesticide together with any of the conventional additives including surfactants, wetting agents, dispersing agents, anti-evaporation agents and carriers.

Suitable pesticides which may be present in composition a) include zinc and/or manganese ethylene-bis-dithiocarbamate, copper oxychloride, N-(trichloromethylthio)-phthalamide, N-(trichloromethylthio)-cyclohex-4-ene-1,2-dicarboximide, N-dodecylguanidine acetate, sulphur, dinitro-(1-methyl-heptyl)-phenyl-crotonate, dinitro-(1-methyl-heptyl)-phenol, 2-phenyl-N-(2,6-dimethylphenyl)-N-(1-methoxycarbonyl-ethyl)-acetamide, N-(3,5-dichlorophenyl)-5-methyl-5-carboethoxy-oxazolidine-2,4-dione, zinc dimethyldithiocarbamate, zinc propylene-bis-dithiocarbamate. Mixtures of two or more pesticides may also be present.

Suitable anti-evaporation agents which may be used in composition a) include polyoxyethylated lauryl alcohol, glycerine or mixtures thereof.

Suitable wetting agents include sodium dodecylbenzenesulphonate, sodium sulphosuccinate.

Examples of dispersing agents suitable for use in the invention include sodium lignin sulphonate, calcium lignin sulphonate, ammonium lignin sulphonate, aluminium lignin sulphonate and mixtures thereof.

Examples of suitable carriers include kaolin, celite, water, talc or diatomite.

It is essential that the composition is readily suspendable or emulsifiable in water if it is not already in the form of an aqueous solution.

Sodium polymethacrylate having a molecular weight comprised between 5,000 and 90,000 is soluble in water. The formulation of the invention contains the components a) and b) in a single pack and may be dispersed in water immediately before spraying in quantities of from 3 to 30% by weight and may be sprayed over the target to be treated, e.g. from a helicopter or aircraft, provided with a distribution apparatus consisting of a container, a pump and a distributing bar equipped with nozzles arranged at a perpendicular angle to the axis of advancement of the helicopter or aircraft.

The invention will now be illustrated by the following Example.

EXAMPLE

In order to assess the degree of anti-drift effect, there was traced on the ground a track consisting of the projection of the nozzle-carrying bar of the helicopter from which the suspension was to be sprayed. Along the mid-line of the track there was placed directional signals to assist the helicopter pilot in maintaining the apparatus on the centre line of the track. The width of the track was 20 metres and its length amount to 1 kilometre. On this track were placed, at regular intervals, glass sheets to determine the coverage achieved by the formulation. The track was then widened by 2 metres on each side so as to form an overall strip 24 metres wide. On the lateral 2 metre margins of the strip were arranged at regular intervals glass sheets, which were not, however, aligned with those of the inner track. The lateral margins served to determine the drift.

The covering effect on the glass sheets placed on the ground and on the existing vegetation was assessed by sight as well as by incorporation in the suspension of the formulation a tracer sensitive to Wood light. The helicopter flew over the track at a height of 10 metres.

The pesticide formulations under investigation had the following composition:

ACCORDING TO THE INVENTION

Formula A

A wettable powder consisting of:		% by weight	
	zinc ethylene-bis-dithiocarbamate	65	
20	polyoxyethylated lauryl alcohol	5	20
	sodium dodecylbenzensulphonate	5	
	sodium lignin sulphonate	5	
	sodium polymethacrylate	1 to 10	
	kaolin to make	100	

25 *Formulation B* 25

A concentrated aqueous suspension consisting of:		% by weight	
	manganese ethylene-bis-dithiocarbamate	40	
	polyoxyethylated lauryl alcohol	5	
	sodium sulphosuccinate	3	
30	ammonium lignin sulphonate	5	30
	sodium polymethacrylate	1 to 10	
	water to make	100	

ACCORDING TO THE PRIOR ART
Formulation M

	A wettable powder consisting of:	% by weight	
	zinc ethylene-bis-dithiocarbamate	65	
5	polyoxyethylated lauryl alcohol	5	5
	sodium dodecylbenzensulphonate	5	
	sodium lignin sulphonate	5	
	kaolin to make	100	

with an extempore admixture of dihydroxyethyl cellulose (at the moment of its use).

10 *Formulation N* 10

	A concentrated aqueous suspension consisting of:	% by weight	
	manganese ethylene-bis-dithiocarbamate	40	
	polyoxyethylated lauryl alcohol	5	
	sodium sulphosuccinate	3	
15	ammonium lignin sulphonate	5	15
	water to make	100	

with an extempore admixture of polyvinyl alcohol (at the moment of use of said formulation).

Formulation A was subdivided into A₁ containing 2% of sodium polymethacrylate, A₂ containing 3% ... to A₈ containing 10% of polymethacrylate.

20 Formulation B was subdivided in the same manner as Formulation A ... 20

Formulation M was subdivided in a similar manner M ... M₉ containing 1 ... 10% by weight of dihydroxyethyl cellulose respectively.

Formulation N was subdivided in a similar manner N ... N₉ containing 1 ... 10% by weight of polyvinyl alcohol.

25 The spraying was conducted as described above, dispersing the formulations in water to form a composition of 3% by weight of the formulation, immediately before the take off of the helicopter. 25

It was observed that the formulations containing sodium polymethacrylate (formulations A and B) were suspended without any difficulty, while the formulations M and N containing derivatives of cellulose or polyvinyl alcohol, formed agglomerates and swelled so much that there was required a long time for the preparation of the suspension as well as continuous mixing.

30 The spraying of the formulations was achieved utilising a bar of length 14 metres, placed at a perpendicular angle to the line of flight of the helicopter, and fitted with 70 nozzles of 1.5 mm diameter arranged at 20 cm intervals. 30

35 With the suspensions obtained from Formulations A and B no appreciable drift (at most 1 to 2 metres beyond the limit of the 20 meter width of the track) was observed while the vegetation and glass plates in the centre track appeared uniformly covered by droplets of suspension. No clogging of the nozzles occurred. 35

Similar satisfactory results were obtained when using formulations according to the invention, based on compositions containing the other pesticides listed above.

40 However, when using the suspensions derived from Formulations M and N drifting, even to the extent of 25 metres beyond the fixed 20 metre track was observed. Also the coverage provided to be non-uniform and insufficient because of the evaporation of the water from the sprayed droplets. Clogging of the distributing nozzles often occurred particularly with suspensions formed from Formulation M. 40

45 CLAIMS 45

1. A pesticide formulation comprising:

- a) from 90 to 99% by weight of one or more pesticide compositions in the form of a wettable powder, suspension, emulsion or solution,
- b) from 1 to 10% by weight of sodium polymethacrylate having a molecular weight of from 5,000

to 90,000,
the pesticide formulation being readily capable of dispersion or dilution with water to provide a
sprayable composition containing from 3 to 30% of said pesticide formulation, which sprayable
composition may be distributed from an aircraft with little or no drift effect.

- 5 2. A formulation as claimed in Claim 1, in which the pesticide comprises zinc and/or manganese ethylene-bis-dithiocarbamate. 5
3. A formulation as claimed in Claim 1, in which the pesticide comprises copper oxychloride.
4. A formulation as claimed in Claim 1, in which the pesticide is N-(trichloromethylthio)-phthalimide.
- 10 5. A formulation as claimed in Claim 1, in which the pesticide is N-(trichloromethylthio)-cyclohex-4-ene-1,2-dicarboximide. 10
6. A formulation as claimed in Claim 1, in which the pesticide is N-dodecylguanidine acetate.
7. A formulation as claimed in Claim 1, in which the pesticide is sulphur.
8. A formulation as claimed in Claim 1, in which the pesticide is dinitro-(1-methyl-heptyl)-phenyl-crotonate. 15
9. A formulation as claimed in Claim 1, in which the pesticide is dinitro-(1-methyl-heptyl)-phenol.
10. A formulation as claimed in Claim 1, in which the pesticide is 2-phenyl-N-(2,6-dimethylphenyl)-N-(1-methoxycarbonylethyl)-acetamide.
11. A formulation as claimed in Claim 1, in which the pesticide is N-(3,5-dichlorophenyl)-5-methyl-5-carboethoxy-oxazolidin-2,4-dione. 20
12. A formulation as claimed in Claim 1, in which the pesticide is zinc dimethyldithiocarbamate.
13. A formulation as claimed in Claim 1, in which the pesticide is zinc propylene-bis-dithiocarbamate.
14. A formulation as claimed in any preceding claim, in which the pesticide composition contains one or more of a surfactant, wetting agent, dispersing agent, anti-evaporation agent and carrier. 25
15. A formulation as claimed in Claim 1 substantially as herein described with reference to Formulations A and B.
16. A sprayable pesticide composition comprising from 3 to 30% by weight of a pesticide formulation as claimed in any preceding claim and from 70 to 97% by weight of water.
- 30 17. A method of applying pesticide to vegetation comprising spraying a composition as claimed in Claim 16 from an aircraft. 30